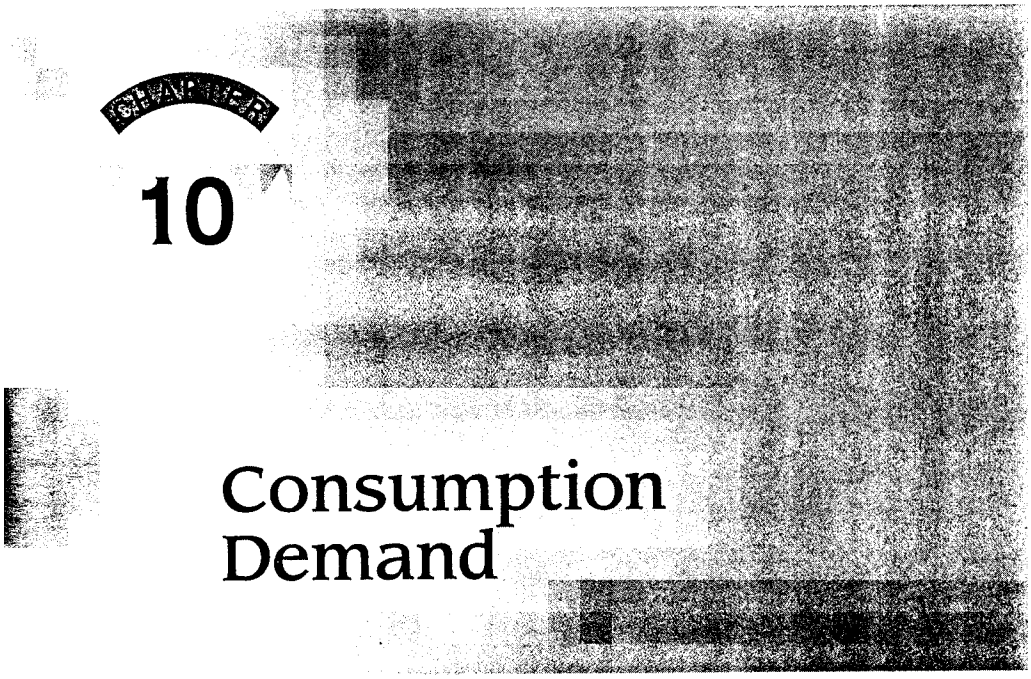

10

Consumption Demand

Consumer behavior—what, how much, and when individuals consume—has been a lifetime study of thousands of economists. This is not surprising, for in economics the consumer occupies center stage. A first principle of microeconomics is that consumers choose their consumption plans in order to maximize their satisfaction or utility. And ever since Adam Smith, the performance of an economic system has been judged by how efficiently it allocates scarce resources to satisfy the wants of consumers. So it is natural to start with consumers in our examination of the micro foundations of macroeconomics.

Traditionally, macroeconomists have been concerned with consumption because consumption is such a large and important component of aggregate demand. In Part I we saw that consumption is about two-thirds of all spending and that the response of consumption to changes in income—the consumption function—is a crucial ingredient in macroeconomic analysis. In the first section of this chapter we look at the empirical evidence on consumption. We show that this evidence raises questions about the simple consumption function, and then we show how consumption theory has been reconstructed in light of this empirical evidence. We also examine the response of consumption to interest rates.

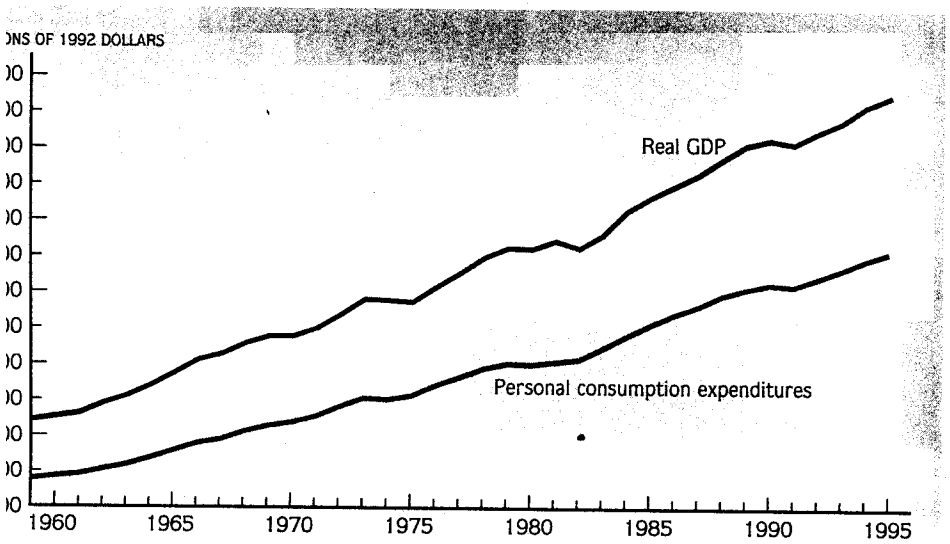

FIGURE 10.1 Consumption Expenditures and GDP

Real GDP and real personal consumption expenditures grow at about the same rate over long periods of time so that, on average, consumption expenditures maintain roughly a two-thirds share of GDP. However, over the business cycle, consumption expenditures fluctuate much less than GDP. Consumption expenditure is less volatile than the other components of GDP.
Source: *Economic Report of the President*, 1996, Table B-2.

FLUCTUATIONS IN GDP, CONSUMPTION, AND INCOME

As the overall economy grows and fluctuates, so does consumption. Figure 10.1 shows how real GDP and personal consumption expenditures have grown and passed through cycles together during the period 1959 to 1995. Note that *over the long run, consumption expenditures and GDP grow at about the same rate, but over short-run business cycles, consumption expenditures fluctuate less than GDP.*[1] The smoother path for consumption ex-

[1]Note that the increasing gap between real GDP and real consumption in Figure 10.1 is not inconsistent with the fact that the *ratio* of real consumption to real GDP

penditures is particularly evident during the period 1980 to 1984 when real GDP fell and rose sharply, while consumption expenditures slowed down only slightly before returning to a more normal pace. This relatively smooth behavior of consumption expenditures compared with GDP is one of the most important facts of the business cycle.

The smoothness of consumption differs greatly by type of consumption. Figure 10.2 shows the breakdown of personal consumption expenditures into its three components: durables, nondurables, and services. Note that the relatively smooth behavior of consumption expenditures is most striking for services, which grow steadily regardless of the fluctuations in the economy. Nondurables fluctuate a bit more, but most of the business cycle fluctuations in consumption expenditures are due to durables. When recessions occur, people reduce their purchases of durable items such as furniture and automobiles much more than their purchases of nondurable items such as food; service items such as medical care hardly fluctuate at all. Note, too, that services now represent the largest and fastest-growing component of

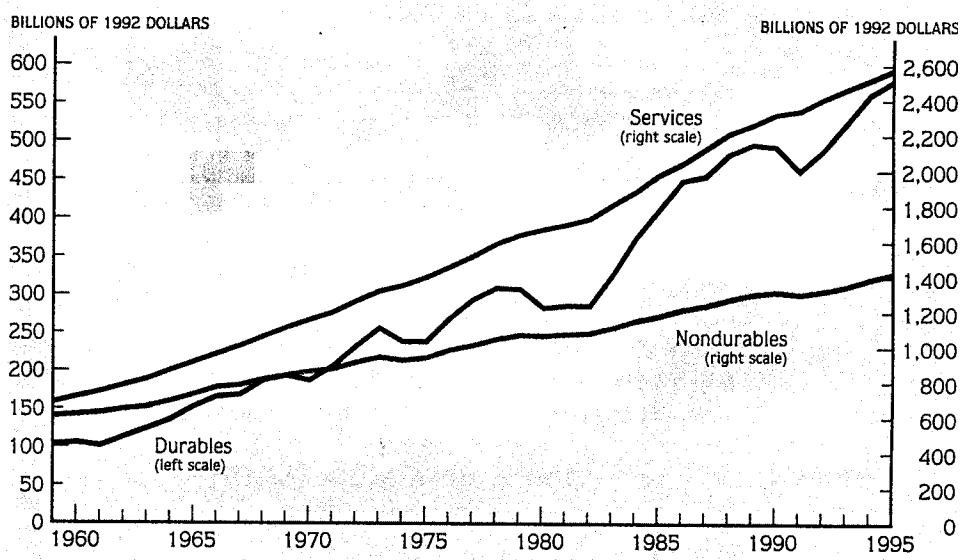

FIGURE 10.2 Fluctuations in the Components of Real Personal Consumption Expenditures

Expenditures on services grow smoothly with little cyclical fluctuation. Expenditures on durables are the most volatile component of consumption.

consumption. As services become more important, we might expect overall consumption expenditures to become less volatile.

Overall consumption behavior would show even smaller fluctuations if we looked at the true economic measure of **consumption** rather than at **consumption expenditures.** The distinction between consumption and consumption expenditures is a subtle one, but takes on special importance in the case of durables. Consider a car, for example. Expenditure on a car occurs at the time that we buy the car and bring it home from the car dealer, even if we finance it by borrowing. Consumption of the car is then spread out over several years as we drive the car and it gradually deteriorates through normal wear and tear. Expenditure occurs when the car is acquired; consumption occurs as the car is used up. Consumption of durables is more spread out over time and is smoother than expenditure on them. For services and nondurable items there is no meaningful distinction between consumption and expenditure: when we purchase a haircut, we consume it at the same time. Because consumption of durables fluctuates less than expenditures on durables, it is clear that total consumption has smaller fluctuations than total consumption expenditures.

GDP and Personal Disposable Income

Why does consumption fluctuate less than GDP? Part of the answer can be found in the behavior of disposable personal income. As we saw in Chapter 6, according to the simplest theory, consumption depends on personal disposable income: when fluctuations in disposable income are small, fluctuations in consumption will be small as well. We stressed in Chapter 2 that GDP is very different from the personal disposable income that is available to consumers for spending. GDP is about 40 percent greater than personal disposable income. Part of GDP is not really income at all because it includes the depreciation of machines, factories, and housing. An important part of GDP is unavailable to consumers because it is paid to the various levels of government in the form of taxes. Still another part is plowed back into corporations in the form of retained earnings rather than being paid out to consumers. On the other hand, some people receive transfers from the government—such as unemployment compensation or social security—that are not related to current production.

Although the difference between GDP and disposable income is large on average, what is more important for our purposes is that the difference shrinks during recessions and expands during booms. Taxes fall during recessions, and transfers increase because more people collect unemployment insurance and social security. Therefore disposable income does not fall as much as GDP. These changes in taxes and transfers are sometimes called **automatic stabilizers** because of their stabilizing effect on disposable income; we will be studying them in more detail in Chapter 13. Retained earnings also fall during recessions, because corporations don't cut their dividends very much and thus further mitigate the effect on disposable income. The sum of these effects is shown in Figure 10.3, where real GDP and real disposable income are plotted for the years 1959 to 1995.

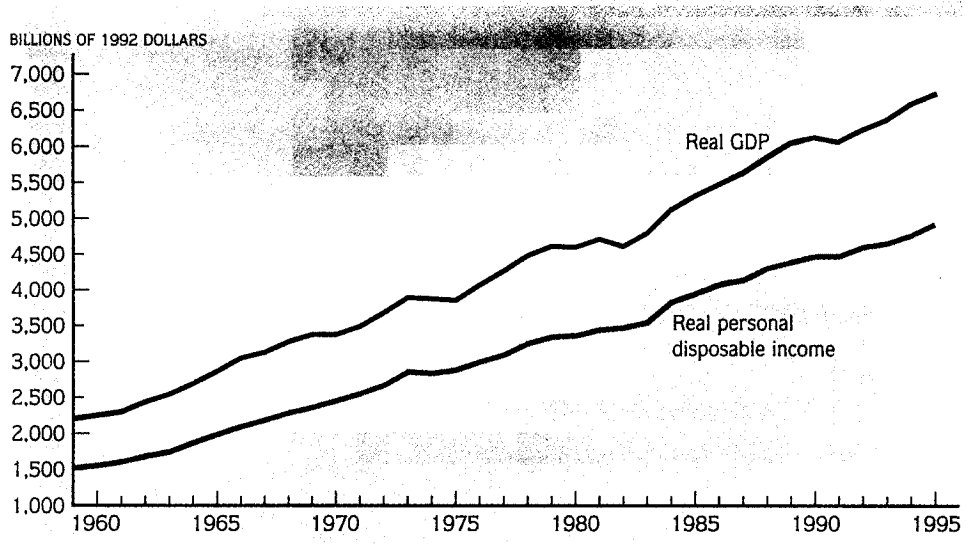

FIGURE 10.3 Real GDP and Real Personal Disposable Income

Disposable income fluctuates much less than real GDP. The automatic stabilizers—taxes and transfers—as well as the dividend policies of corporations prevent disposable income from falling as far as GDP during recessions.
Source: *Economic Report of the President*, 1996, Tables B-2 and B-27.

Figure 10.3 shows that personal disposable income fluctuates less than GDP. On average, when GDP falls during a recession, disposable income does not fall as much. There are exceptions to this general rule, but, again, on average, over this period a fall in real GDP of $10 billion reduced real disposable income by only $4 billion.[2]

[2]The relationship was estimated by comparing real disposable income and real GDP in the United States each year during the 1959–1995 period. The least-squares relation between the *change* in real disposable income and the *change* in real GDP has a slope coefficient of .4. The least-squares line is the straight line that minimizes the sum of squared vertical distances between the dots and the line.

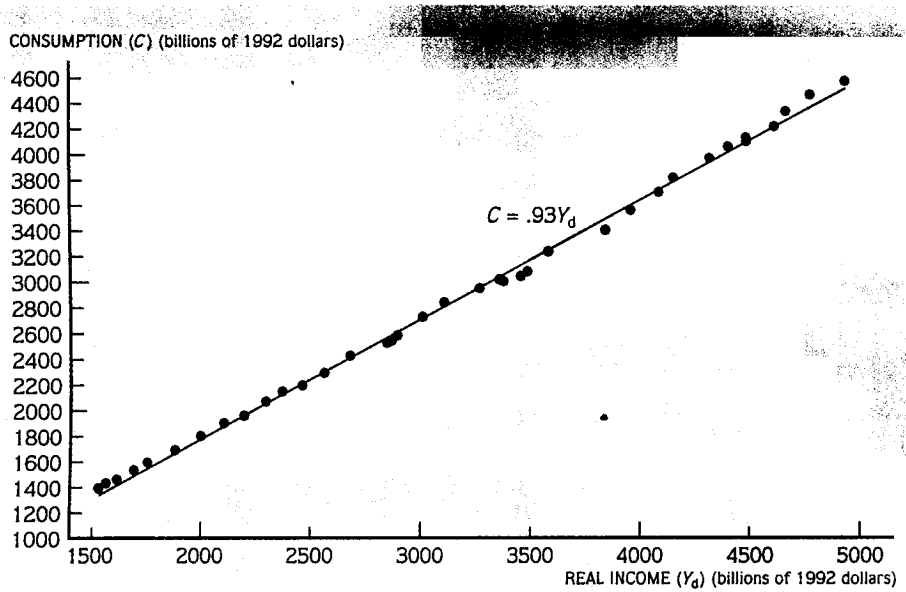

FIGURE 10.4 The Relation between Real Disposable Income and Real Consumption Expenditures

The horizontal position of each dot shows real disposable income in that year and the vertical position shows real consumption in that year. The straight line is a simple consumption function that is fit through the scatter of dots. The vertical distances between the line and the dots measure the error in the consumption function.
Source: *Economic Report of the President*, 1996, Table B-27.

The Relation between Real Disposable Income and Consumption

As we have just seen, part of the reason why consumption fluctuates less than real GDP is that disposable income fluctuates less than GDP. But can all of consumption behavior be explained by current personal disposable income, as the simplest consumption function would suggest? In Figure 10.4 we examine the relationship between personal consumption expenditures and personal disposable income for the period from 1959 through 1995. Each dot in Figure 10.4 represents real consumption and real disposable

ship by drawing a straight line through the dots.[5] The straight line gives the relationship

$$C = .93Y_d \tag{10.1}$$

which is in the form of the simple consumption function; the **marginal propensity to consume (MPC)** is .93. On average, the U.S. public spends about 93 percent of its disposable income on consumption goods and saves 7 percent. Figure 10.4 indicates that consumption is sometimes less and sometimes greater than predicted by the simple consumption function. The errors are given by the equation

$$\text{Error} = C - .93Y_d \tag{10.2}$$

and are measured by the vertical distances between the line and the dots in Figure 10.4. The errors appear to be small. The simple consumption function seems to give a surprisingly good description of consumption.

10.2 DEFECTS IN THE SIMPLE KEYNESIAN CONSUMPTION FUNCTION

Unfortunately, Figure 10.4 paints too rosy a picture about the reliability of the simple consumption function. Although the errors in Figure 10.4 appear small to the naked eye, for some purposes—such as forecasting or policy analysis—they are actually quite large. A more revealing picture of the errors is found in Figure 10.5, where the error in the simple consumption function (as calculated in Equation 10.2) is plotted for each year. The vertical scale in Figure 10.5 is much finer than the vertical scale in Figure 10.4. This magnifies the errors, much like a photographic enlargement, and makes them easier to analyze.

Very large negative errors occurred in 1973 through 1975. People consumed much less than normal given their disposable incomes; they acted as if they distrusted their income figures in those years. Why? Perhaps they were becoming pessimistic about their incomes in the future; the stock market had

[5]We estimated this relationship by finding the straight line that minimizes the sum of the squared vertical distances between the dots and the line (that is, the least-squares line) for the years 1959 through 1995. This line has a negligible intercept or constant term, which is therefore omitted

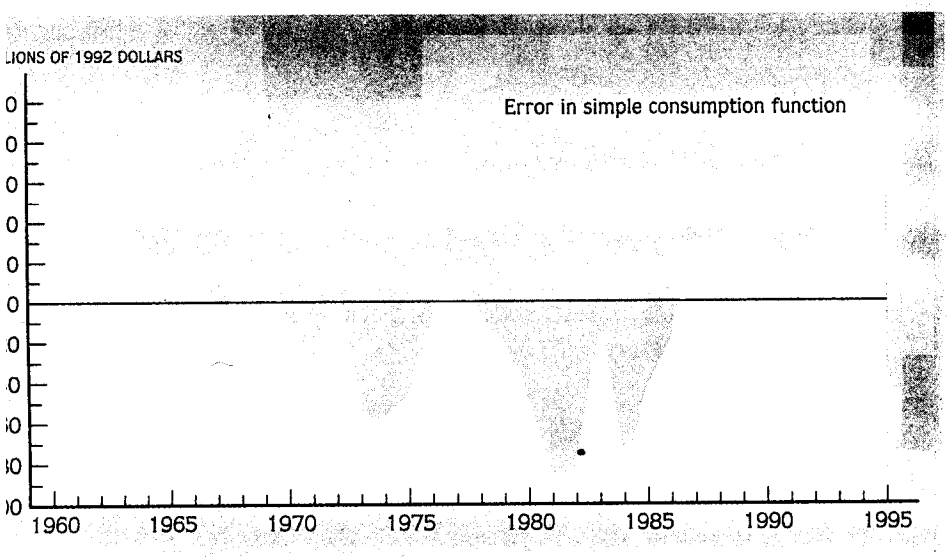

FIGURE 10.5 Error Analysis in the Simple Consumption Function

This diagram gives a microscopic view of the errors in the simple consumption function that are barely visible in Figure 10.4. It blows up the distances between the actual consumption-income dots and the simple consumption-income line in Figure 10.4. The distances are then plotted each year from 1959 through 1995.
Source: The errors are computed from Equation 10.2 with consumption and income data from Figure 10.4.

recently fallen and the price of oil rose dramatically starting in 1973. These uncertainties about the future could have led to caution and increased saving.

At the other extreme, consumption rose well above its normal relationship to disposable income in the 1987-through-1990 period. The economy was on a consumption binge. Surveys confirmed that families were more confident about their own financial positions and the prospects for the economy than they had ever been before. A similar buying binge occurred just after World War II, another episode of high confidence about the future. One factor in the high confidence of 1987 to 1989 may have been the Tax Reform Act of 1986, which lowered tax rates for many families. In 1987, consumer confidence was matched by confidence on Wall Street; the stock market reached record levels in relation to corporate earnings. Even the crash of the stock market in October 1987 did not mark the end of high consumer confidence or high levels of consumption in relation to disposable income.

In 1991 and 1992, consumption was closer to its normal relation to

in 1991 and 1992. The fall of consumption from far above its normal relation to income to a more moderate level, still above the normal relation, was one of the factors leading to slow recovery from the recession that started in July 1990. Consumption was again high in 1993 and 1994 as the economy boomed.

Note that these informal but plausible explanations of the errors in the simple theory imply a much more sophisticated consumer than the one that simply looks at current income, as the Keynesian model postulates. Expected future income enters the decision. The main contribution of the newer theories of consumption described in the next section is to bring these expectations of the future explicitly into account.

The Effect of Consumption Errors on Forecasting and Policy

Some perspective on the practical importance of these errors in the consumption function can be gained by looking at their effect on economic forecasting and policy. These errors can have significant effects on economic forecasts. For example, as shown in Figure 10.5, the error in the consumption function in 1994 was about $59 billion. From 1993 to 1994 real GDP increased by $208 billion, or by 4.0 percent. A forecaster who missed the error in the consumption function in 1986 would have underpredicted real GDP growth by $59 billion—predicting a GDP growth of about 2.9 percent rather than the 4.0 percent that actually occurred.

Such large forecasting errors can obviously lead to economic policy errors. More fiscal stimulus might have been called for in 1974 and 1975 if the unusually low consumption demand had been correctly forecast in advance. Moreover, if consumers don't automatically spend 93 cents of every dollar of additional disposable income—as the simple model predicts—then a reduction in taxes aimed at stimulating demand might not work as planned; it might generate too little or too much stimulus. More complicated consumer behavior makes policymaking difficult, especially if policymakers don't understand the more complicated behavior.

Short-Run versus Long-Run Marginal Propensity to Consume

There is one systematic feature of the errors in the simple consumption function that is difficult to see in the charts with a naked eye, but that nonetheless has provided a crucial insight and stimulus to advanced research on consumption: *On average, consumption is smoothed out compared with disposable income; consumption fluctuates less than disposable income.* This phenomenon can be detected and illustrated by using the concept of the

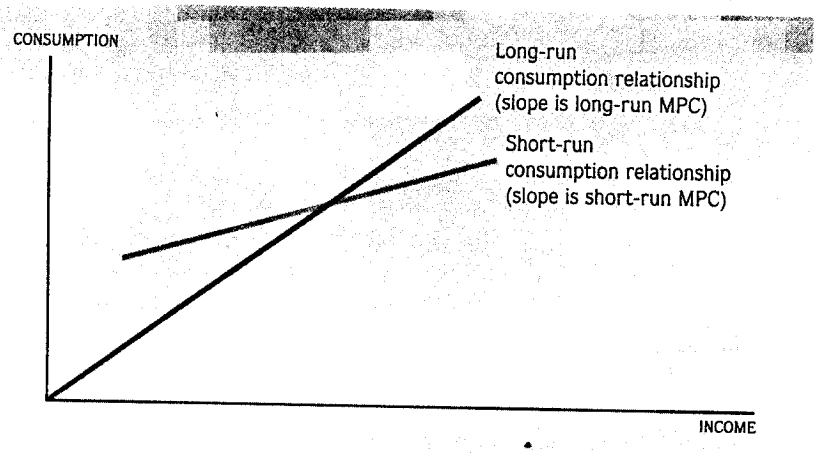

FIGURE 10.6 The Marginal Propensity to Consume in the Short Run and in the Long Run

The steeper line shows how consumption rises with income in the long run. Its slope is the long-run marginal propensity to consume (MPC). The flatter line shows how consumption rises with income in the short run. Its slope is the short-run MPC.

ow the long-run and the short-run marginal propensities to consume differ or total consumption. The **long-run marginal propensity to consume** ells us how much consumption will increase over the long haul when personal disposable income rises. For total consumption the long-run marginal ropensity to consume is .93, as we have already seen in Equation 10.1.

The **short-run marginal propensity to consume** tells us how much onsumption will rise over the short run—during one year or during one usiness cycle—when disposable income rises. As Figure 10.6 illustrates, the ıort-run marginal propensity to consume is less than the long-run marginal ropensity to consume.

Table 10.1 shows the actual difference between the short-run and the ng-run marginal propensity to consume in the United States from 1959 to 994 for total consumption and two of its components. The short-run marnal propensity to consume can be calculated statistically by noting how uch consumption changes from one year to the next when disposable come changes. For total consumption the short-run MPC is .72, compared ith .93 for the long-run MPC. The difference is even more pronounced for nsumption of nondurables plus services: for each dollar decrease in dis-osable income, nondurables and services consumption falls by 41 cents in e short run, but the fall is 78 cents over the long run if that dollar ...

TABLE 10.1 Short-Run and Long-Run Marginal Propensity to Consume 1959–94

	Total Consumption	Nondurables plus Services	Durables
Long-run MPC	.93	.78	.15
Short-run MPC	.72	.41	.31

Note: The long-run MPCs are based on the least-squares fit of the annual *levels* of real consumption and real disposable income. The short-run MPCs are based on the fit of the year-to-year *changes* in the same two variables.

short-run MPC is reversed for durable expenditures; unlike the other components of consumption, durables are more sensitive to income in the short run than in the long run. A complete theory of consumption has to come to grips with these empirical observations.

GDP, CONSUMPTION, AND INCOME

1. Consumption fluctuates much less than GDP. The least stable component of consumption expenditures is durables consumption. Services and nondurables consumption grow more smoothly.
2. The main reason that consumption fluctuates less than GDP is that disposable income fluctuates less than GDP. Consumption is financed out of disposable income.
3. Over the past few decades in the United States, consumption has more or less tracked income, according to a simple Keynesian consumption function, with a marginal propensity to consume of .93. Of each incremental dollar of disposable income, 93 cents has been spent on consumption goods and 7 cents has been saved.
4. There have been significant deviations from the simple consumption function. Just after World War II, consumers spent more than the simple function predicted. In the mid-1970s, they spent quite a bit less. And in 1987 to 1990 they again consumed much more than the simple function predicted.
5. A systematic feature of consumption behavior is that the short-run marginal propensity to consume is less than the long-run marginal propensity to consume. The change in consumption that results from a change in income is apparently spread over a number of years.

THE FORWARD-LOOKING THEORY OF CONSUMPTION

A number of different theories of consumption have been developed in response to the deficiencies in the simple consumption function. The most durable and widely accepted today are the **permanent-income theory** developed in the 1950s by Milton Friedman and the **life-cycle theory** developed independently at about the same time by Franco Modigliani of the Massachusetts Institute of Technology.[4] The two theories are closely related, and together they have served as a foundation for most of the rational expectations research on consumption in macroeconomics in recent years. We will refer to them jointly as the **forward-looking theory of consumption.** The theory embodies the basic idea that individual consumers are forward-looking decision-makers. The life-cycle theory gets its name from its emphasis on a family looking ahead over its entire lifetime. The permanent-income theory is named for its distinction between permanent income, which a family expects to be long-lasting, and transitory income, which a family expects to disappear shortly. In practice the theories differ primarily in the types of equations used to express the basic idea of forward-looking consumers and to implement this idea empirically.

Like the simple consumption function, the forward-looking theory of consumption assumes that families or individuals base their consumption decisions on their disposable incomes. To simplify matters, we will begin by ignoring factors other than disposable income that might also influence consumption, such as interest rates. The forward-looking theory breaks ranks with the simple consumption function by saying that consumers do not concentrate exclusively on this year's disposable income. Instead, it also looks ahead to their likely future disposable income, which will depend on their future earnings from working, on their future income from wealth they have accumulated, and on how high taxes will be in the future. Based on their current income and expected future disposable income, they decide how much to consume this year after taking account of their likely consumption in future years as well.

[4]Friedman published his findings in 1957 in a famous book, *A Theory of the Consumption Function* (Princeton University Press); the findings on the life-cycle theory were published in a series of papers, the most important of which are F. Modigliani and R. E. Brumberg's, "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data," in K. K. Kurihara, ed., *Post-Keynesian Economics* (New Brunswick, N.J.: Rutgers University Press, pp. 388–436), and A. Ando and F. Modigliani, "The 'Life-Cycle' Hypothesis of Saving: Aggregate Implication and Tests," *American Economic Review*, Vol. 53 (March 1963), pp. 55–84.

The consumption decision is thus much like a plan; this year's consumption is the first year of a plan that covers perhaps the next 50 years. Next year, the plan will have to be adjusted to take account of all the new information that has become available, but if everything works out as expected the plan will be followed. Although few consumers actually sit down and work out formal forward-looking plans in great detail, it is likely that a significant fraction do some informal planning when they borrow to buy now and plan to pay off the loan later with future anticipated earnings, or when they save for retirement. We will talk about a very self-conscious plan, of the sort that an economist might make, but we recognize that most families are much more informal in their planning.

The Intertemporal Budget Constraint

To describe how such a planning process results in a consumption decision, we will focus on a single family. The family could be a single individual, a couple, a single-parent household, or two parents and their children. The first aspect we will look at is the budget constraint the family faces. The budget constraint applies not to one single year, but to many future years taken together. The constraint is more flexible in any one year than it is over time; in any one year a family can consume more than its disposable income by borrowing or by drawing down some of its financial assets. But a family can't go on forever consuming more than its disposable income; eventually it will run out of assets or places to borrow. The family faces an **intertemporal budget constraint** that limits its consumption over the years. In some years, a family will consume less than its income; the excess of income over consumption—saving—is then added to the family's financial assets and can be used for consumption in later years. Consumption this year is thus reduced so that consumption in later years can be increased. The budget constraint incorporates the accumulation of assets that results from savings.

The intertemporal budget constraint can be described in words as follows:

Assets at the beginning of next year
= Assets at the beginning of this year
+ Income on assets this year } Disposable
+ Income from work this year } income } Saving
− Taxes paid this year
− Consumption this year

Assets include items such as bank deposits, bonds, corporate stock, and pension funds. There are two types of income: (1) income on assets, such

as interest payments from the bank where the family holds its deposits, and (2) income from work. If a family adds to its assets, then it also adds to its future income on those assets. Hence it is important to distinguish between the two types of income.

Disposable income is, of course, income on assets plus income from work minus taxes. Note that the budget constraint simply states that each year's saving—disposable income less consumption—is added to assets.

To give a clearer picture of the intertemporal budget, we introduce the following symbols:

A_t = Assets at the beginning of year t

R = Interest rate on assets

E_t = Income from work during year t

T_t = Taxes during year t

C_t = Consumption during year t

The small subscript indicates the year. The interest rate R tells us how much ncome a given amount of assets will earn. For example, if the interest rate s 5 percent and assets A_t equal \$1,000 in year t, then income on assets is \$50 n year t. (The interest rate R is the *real* interest rate, that is, the nominal nterest rate less the expected rate of inflation).

Using these symbols, the intertemporal budget constraint can be writ- en as follows:

$$A_{t+1} = A_t + RA_t + E_t - T_t - C_t \qquad (10.3)$$

he six algebraic terms in Equation 10.3 correspond one for one with the six ems listed in the budget constraint that we wrote in words above. The ubscript t + 1 indicates assets at the beginning of year t + 1. (For example, year t is 1995, then year t + 1 is 1996.) The budget constraint, Equation 0.3, applies to all years of the family's future—working years and retirement ears. By applying this equation year after year, the family can figure out hat its asset position will be many years in the future, given expectations bout the interest rate, income from work, and taxes. By reducing consump- on this year, the family can increase its assets in future years. The increased ssets—plus the interest earned on these assets—could be used for con- mption on timely items such as the children's education, for retirement, or s a bequest. (The interest rate R is measured in fractions in this formula: if ie interest rate is 5 percent, then set R equal to .05 in Equation 10.3. Then times A, for example, equals \$50 if A equals \$1,000.)

practical, since it means the family is lending to others, rather than borrowing. For most people, it is impractical to have their assets drop significantly below zero. Our concept of assets is *net* across all borrowing and ownership of the family; if a family buys a house with a 20 percent down payment and takes on a mortgage for the remaining 80 percent, its net asset position is positive. The value of the house as an asset exceeds the liability of the mortgage. Borrowing from a positive net asset position is perfectly practical—almost everybody does it. But it is difficult to borrow when there is a negative net asset position. An exception might be medical or business school students who borrow because their expected future incomes are so favorable.

Preferences: Steady Rather than Erratic Consumption

Many different consumption plans are feasible. As long as the family is careful not to consume too much, it has a wide choice about when to schedule its consumption. It could consume very little in the early years and build up significant assets by middle age. Or it could consume as much as possible and keep its assets only barely positive. Which of the feasible plans will the family choose? The forward-looking theory of consumption assumes that *most people prefer to keep their consumption fairly steady from year to year.* Given the choice between consuming \$10,000 this year and \$10,000 next year, as against \$5,000 this year and \$15,000 next year, people generally choose the even split. There are exceptions, but it seems that most people prefer not to have ups and downs in their standard of living.

Figure 10.7 shows a typical path for income for a family with a steady consumption plan. Income from employment is low in the early years and gradually rises until retirement, as job experience and seniority increase. During retirement, income from work is zero. Note how consumption is relatively large compared with income in the early years of work; young families tend to borrow when they can in anticipation of greater future income in later years. During the years immediately before retirement, consumption is relatively low as the family saves more in anticipation of retirement. Finally, during retirement consumption is much greater than income as the family draws down its assets.

Preferences: How Large an Inheritance for the Next Generation?

Figure 10.7 illustrates the important features of the typical smooth consumption path. But the assumption that families prefer a smooth consumption path is still not sufficient to pin down one consumption path among those

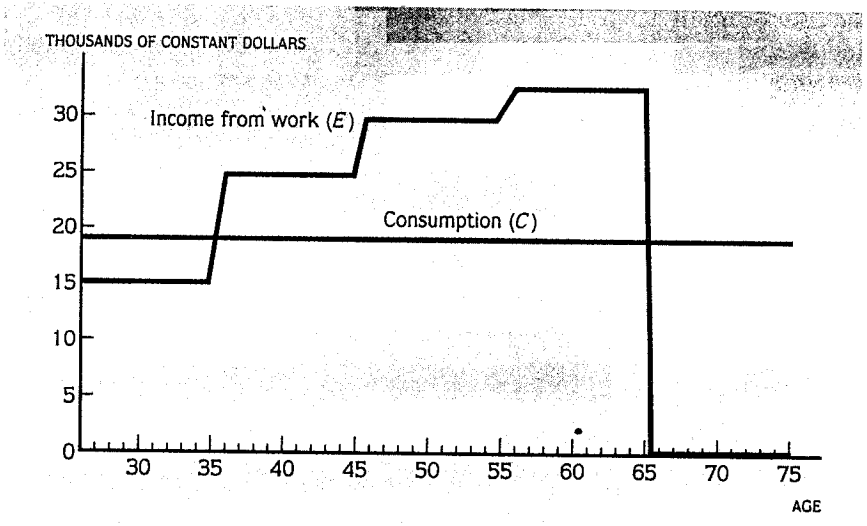

FIGURE 10.7 Illustration of Steady Consumption Compared with Income Growth and Decline

ncome from work is assumed to grow as experience and seniority increase and then drop to zero luring retirement. Thoughtful forward-looking consumers who prefer a smooth consumption path vill tend to borrow during their early years, save in their middle years, and draw down their assets luring retirement.

vill leave the family with different levels of assets at the end of the parents' ifetimes. Figure 10.8 shows the path of assets for the smooth consumption ath already shown in Figure 10.7 (Path 2) along with asset paths for higher Path 1) and lower (Path 3) consumption paths.

A higher consumption path leaves fewer assets at the end of the life-ime. To pin down the consumption path completely, we need to make an ssumption about what the parents' preferences are for assets at the end of heir lifetimes. How much will they want to leave to the next generation as nheritance? If parents are convinced that their children can make it on their wn, they may prefer to consume most of their assets during retirement. Or ney might want to reward their children for doing well by giving a large equest. There is little agreement among economists on what motivates be-uests.[5] Fortunately, however, many of the important empirical predictions

Douglas Bernheim, Andrei Shleifer, and Lawrence Summers argue that parents use bequests to nfluence their children's actions in "The Strategic Bequest Motive," *Journal of Political Economy*, ol. 93 (December 1985), pp. 1045–1076.

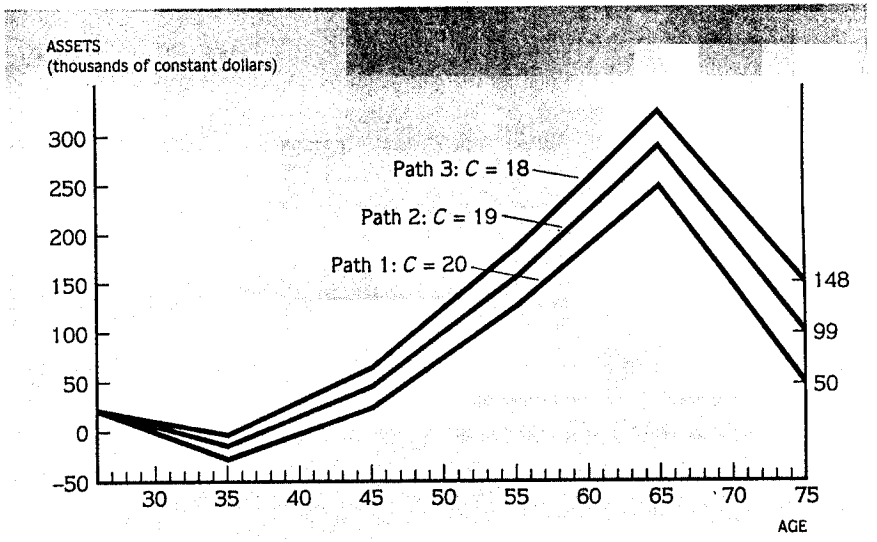

FIGURE 10.8 Assets and Bequests under Smooth Consumption Paths, Starting with $15,000

If consumption follows Path 1 over the family's lifetime, assets will follow the path marked 1, with little left for the next generation. If consumption follows Path 2, sufficiently more assets are accumulated to leave more for the next generation. Along Path 3, consumption is even lower and assets left for inheritance are even higher.

of the life-cycle and the permanent-income hypotheses hold regardless of what assumption we make about inheritance. We will discuss the effect of alternative assumptions below, where the assumption about inheritance does matter.

The Marginal Propensity to Consume out of Temporary versus Permanent Changes in Income

It should already be apparent from Figure 10.7 that there is a relation between the family's current assets plus its expectations about future earnings from work and its consumption decisions. If news comes along that the family is better off, either because it has higher assets today or because it expects higher earnings in the future, the family will adjust its consumption upward. Moreover, it will adjust its future consumption plans upward by about the same amount. If the family reacted to good news by changing only current

consumption and not future planned consumption, it would be planning a consumption path that would not be smooth.

By how much does consumption change when disposable income changes? For forward-looking consumers the answer depends on how long the change in income will last—in particular, whether the change is viewed as *temporary* or *permanent*.

Consider first the case where income increases permanently. An interesting and important example is a permanent cut in taxes, though any other change, such as the winning of a state lottery that pays the family a yearly payment for life, would serve just as well. Suppose that the family learns that its taxes will be lower by a certain amount—say $1,000—this year, next year, and every year in the future. Disposable income increases in the first year by $1,000, and the increase is viewed as permanent. Assume that the tax cut was unexpected so that the family could not have planned for it in advance. If the family didn't change its consumption plans, future assets would pile up quickly. Next year, assets would be higher by $1,000. In later years, this would grow as interest compounded. But next year, there would be another increment to assets in the amount of $1,000, and in later years this too would earn compound interest. Moreover, if the family raised its consumption, assets would still pile up unless the increase in consumption were equal to the decrease in taxes, $1,000. The family's exact plan would depend on how much of the income improvement it wanted to pass on to the next generation. Assuming that the amount of the improvement passed on is zero, we get a simple conclusion: *The marginal propensity to consume from the increase in disposable income is 1. Consumption rises by the full amount of the increase in income when the increase is viewed as permanent.* If the family wanted to pass on some of the increased income as a bequest, then the marginal propensity to consume would be smaller.

Now consider a temporary tax cut of $1,000 that will last only one year; taxes are then expected to return to their normal level in the remaining years. Again assume that the tax cut was unexpected, so that the family could not have adjusted its plans in advance. If the family raises its consumption by $1,000 in the year of the tax cut, then it will finish the year with nothing extra saved. At the end of the year it will have to reduce its consumption to the level previously planned; this goes against the rule that consumption should be smooth. The family can achieve a better consumption plan by raising consumption less than the tax cut and accumulating some assets. Hence, the marginal propensity to consume will be less than 1. But how much less?

We can determine the amount by using the forward-looking model. If the family didn't change its consumption plans at all, the $1,000 would be added to the family's assets and would start earning interest at rate R. Suppose that the interest rate is 5 percent. As the years passed, the increment to assets, including compound interest, would become quite large. After 50 years, $1,000 left to compound at 5 percent interest becomes $12,000. But rather than leave this much more for the next generation, the typical family will probably raise its planned consumption. If it raises planned consumption by the amount of the interest, $50 per year, then after 50 years the family will have just the additional $1,000, not the extra $11,000 in compound interest. Thus, one option for the family is to plan to consume an extra $50 per year and leave an extra $1,000 to the next generation. Or, the family could consume just a bit more and leave nothing extra to the next generation. The intertemporal budget constraint, Equation 10.3, can be used to figure out how much more than $50 the increase in consumption would have to be to exhaust the $1,000 windfall after 50 years.

The forward-looking theory predicts the following consumption rule from this planning process: *If a family receives an unexpected temporary increment to its disposable income, it will raise its consumption by the interest earned by the increment, plus a bit more if it does not want to pass the full amount on to the next generation.* If the tax cut is $1,000, then the rise in consumption is $50, or a little more if not all of the $1,000 is passed on. The marginal propensity to consume from the one-year temporary tax cut, or any other temporary increase in income, is the same as, or a little greater than, the interest rate, or about .05 in this example. It is far, far less than the marginal propensity to consume arising from a permanent increase in income, which is closer to 1. It is also much less than that suggested by the simple consumption function we looked at earlier in the chapter. The difference between the marginal propensity to consume out of a temporary change in income and the marginal propensity to consume out of a permanent change in income is the single most important feature of the newer theories of consumption based on a forward-looking consumer.

Anticipated versus Unanticipated Changes in Income

In each of the above examples we assumed that the change in income was unanticipated. If the change was anticipated, then the family would adjust its plans in advance. How? If the family learns about the temporary tax cut of $1,000 one year in advance, then it will increase its consumption before the tax cut actually takes place. Postponing the increase in consumption to the year of the tax cut would mean that the planned consumption path would not be smooth, and this would violate the steady consumption rule. The increase in the consumption path will be slightly less than in the case where the tax cut was unanticipated, simply because there is one more year of consumption to spread the improved income over. If the family wants to leave the full $1,000 to the next generation, then the increase in consumption will be slightly less than the interest rate times the tax cut. If the tax cut occurs with 50 years on the planning horizon, then consumption will be spread over 51 years. The increase in consumption will thus be about $48.

Note that the marginal propensity to consume in the year that the tax cut is anticipated is astronomical. The change in income is zero in that year and consumption increases by about $48. The marginal propensity to consume is literally infinite! But the important point is that with forward-looking consumers the marginal propensity to consume depends not only on whether the change in income is temporary or permanent, but also on whether it is anticipated or unanticipated.

THE FORWARD-LOOKING MODEL

1. The forward-looking model of consumption assumes that households choose current consumption as part of a lifetime consumption plan.
2. The intertemporal budget constraint implies that total planned consumption cannot exceed total household resources (the sum of current wealth and expected future income). If the household plans to leave a bequest, total planned consumption is less than total resources.
3. Although the forward-looking model can accommodate any pattern of preferences, it is typically assumed that households prefer smooth consumption profiles.
4. The theory predicts that the marginal propensity to consume out of permanent changes in income will be close to 1. The marginal propensity to consume out of temporary changes in income will approximately equal the rate of interest.
5. Another important insight that comes from the theory is that current consumption responds not only to changes in current income, but also to changes in expected future income.

HOW WELL DOES THE FORWARD-LOOKING THEORY WORK?

he key point of the forward-looking theory of consumption is that the marinal propensity to consume from new funds depends on whether the new unds are a onetime increment or will recur in future years. The marginal ropensity to consume from temporary increases is low—only a little above

Consumption in the economy as a whole is the aggregation of the consumption decisions of millions of families. Some tests of the forward-looking model focus on aggregate consumption. Many of the events that matter a great deal for an individual family—births and deaths, promotions, winning big at the racetrack—don't matter at all in the aggregate. The "law of large numbers" guarantees that purely random individual experiences do not influence the total. But some of the influences affecting individual families are common across all families, as, for example, when the economy goes into recession.

The Short-Run and Long-Run MPC: A Rough Check of the Theory

Before looking at the particular methods that Friedman, Modigliani, and other economic researchers have used to test this theory formally, let's see how well it explains the facts of aggregate consumption that we presented in Section 10.3. The most important statistical regularity that the simple consumption function misses is that the short-run marginal propensity to consume is less than the long-run marginal propensity to consume; that is, consumption does not increase as much with income over short-run business cycle periods as it does over long-run growth periods. If consumers usually expect short-run business cycle fluctuations in their income to be temporary, then the forward-looking consumption theory provides an explanation for this finding. If they expect the drop in income that they experience during a recession to be temporary, then they will not cut their consumption as much as if they thought the drop was more lasting. Similarly, they will not increase their consumption so much during the boom stage of a cycle. Is is plausible that many consumers tend to view recessions and booms as temporary? Throughout U.S. history, recessions and booms have in fact been temporary. If consumers can remember this experience, then an expectation that recessions are temporary seems reasonable. Moreover, economic forecasters usually predict a return to a steady growth path following a recession—they at least remember what happened in the last cycle—and their forecasts are covered on television, in newspapers, and in magazines.

There is even an important exception that seems to prove the rule: In the recession that followed 1973 the dramatic increase in the price of oil and other energy sources probably made many consumers feel that the drop in real income they were experiencing was unlike a typical recession and was likely to be more permanent. According to the forward-looking consumption model, consumers therefore would have cut their expenditures by more than the decreased consumption of a typical recession. This is just what happened in 1973 through 1975. (See Figure 10.5, which shows that consumption was

Why Is the Saving Rate Higher in Japan Than in the United States?

ıl saving is personal disposable in-
ss consumption and interest paid
eholds. The *personal saving rate* is
l saving as a percentage of per-
sposable income. For example, in
ıving was 204 billion and the sav-
was 4.1 percent (the calculation
4,959] × 100 = 4.1). The 4.1 per-
sonal saving rate was one of the
n the United States since the
orld War II consumption binge of
ıis low saving rate is just another
hink about the huge errors in the
ɔtion function for 1994 shown in
).5 and discussed in the text
ing an abnormally high fraction
ıable income is the same thing as
ı abnormally low fraction of dis-
ıncome).
ɔercent saving rate is low even
tandards, but saving rates in the
ates are always low by Japanese
s. For most of the post-World
riod, the personal saving rate in
s almost double that in the
ates. In a detailed study of sav-
ıior in Japan and the United
ımio Hayashi of Osaka Univer-
ed that Japanese saving rates
r than U.S. saving rates, even for
e saving definitions that include
and government saving and af-
ments for several different mea-
concepts.
the saving rate higher in Japan?
ard-looking theory of consump-
provide part of the answer. In
with high growth rates, the
ıd to have higher incomes than the old people did when they were young. Since young people tend to save and old people tend to dissave according to forward-looking models, the young people with higher incomes will tend to raise the overall saving rate.

Because Japan has a higher growth rate than the United States, the Japanese saving rate will be higher according to the forward-looking model. Simulations of detailed life-cycle models suggest, however, that the growth differential between Japan and the United States is not the entire explanation of the saving rate differential.

There are other possible explanations. Land and housing prices are very high in Japan. Hence, families need to save more for a down payment to buy a house. Further, there is not as extensive a social security system in Japan; families may feel they have to save more for old age. The tax system in Japan is also thought to favor saving.

There are also some noneconomic explanations. As stated by Hayashi, "If all else fails, there is a cultural explanation. The Japanese are simply different. They are more risk-averse and more patient. If this is true, the long-run implication is that Japan will absorb all the wealth in the world. I refuse to comment on this explanation."*

*Fumio Hayashi, "Why Is Japan's Saving Rate So Apparently High?" in S. Fischer, ed., *Macroeconomics Annual,* Vol. 1, National Bureau of Economic Research, 1986.

Ando and Modigliani: Do Assets Matter for Consumption?

One of the earliest formal statistical tests of the forward-looking theory was done by Albert Ando of the University of Pennsylvania in collaboration with Modigliani. Ando and Modigliani formulated consumption as depending on two factors: (1) current income from work and (2) total assets. In their formulation a change in income, given the value of assets, is assumed to be indicative of a permanent change in income (the current level of income would be representative of all future income). Hence, the marginal propensity to consume from a change in income from work—holding constant the level of assets—would be close to 1. The equation would have to be made more complicated if current income was known to be different from likely future income. On the other hand, their formulation assumes that a change in the value of total assets, given the level of income, would tend to be a temporary change—an example would be a onetime increase in the value of corporate stock. Hence, the marginal propensity to consume from a change in the value of total assets would be close to the interest rate. Algebraically, the Ando-Modigliani consumption function takes the form

$$C = b_1 Y_d + b_2 A, \tag{10.4}$$

where Y_d is disposable income, A is assets, and b_1 and b_2 are coefficients. Note that Equation 10.4 is a modification of the simple Keynesian consumption function: assets have been added as a second factor to income. When Ando and Modigliani fit this simple equation to data in the United States during the period after World War II, they found that b_1 was close to .7 and b_2 was close to .06; this provided striking confirmation for their ideas about consumption. Moreover, the addition of total assets to the equation could eliminate some of the errors in the simple Keynesian consumption function that we noted earlier. For example, the bulge of consumption relative to income in the years just after World War II could be explained by the high level of consumer assets from wartime savings. The decline in consumption starting in 1973 could be explained by the drop in the stock market and other asset valuations. Fluctuations in asset values are not much help in explaining the fluctuations of consumption in recent years, however. Neither the sharp fall in the stock market in 1987 nor the large rise in 1995 and 1996 seemed to have much effect on consumption.

Friedman: Does Past Income Matter for Consumption?

of annual income that has a present value equivalent to the family's assets and expected future income. All other changes in income are then viewed as transitory. Friedman argued that the marginal propensity to consume from permanent income should be close to 1, and the marginal propensity to consume from transitory income should be close to zero. Algebraically, he formulated the consumption function as

$$C = b_p Y_p, \tag{10.5}$$

where Y_p is permanent disposable income and b_p is a coefficient. According to Friedman's formulation b_p should be close to 1.

An important part of Friedman's formulation was his assumption that permanent income is an average of income over the last several years. Thus, if current income suddenly increased, there would be only a small increase in permanent income; income would have to increase for several years in a row before people would expect that permanent income had increased. To test the theory, he thus substituted an average of current income and previous income over the past several years for permanent income in Equation 10.5. Effectively, therefore, consumption should depend on past income as well as on current income. Past income should matter for consumption because it helps people to forecast future income. Although it is an admittedly simple model of people's expectations, Friedman found that his formulation of the consumption function fit the facts better than the simple Keynesian function with current income.

Where Do We Stand Now?

The empirical work of Ando, Modigliani, and Friedman is now more than 40 years old. Economic research in recent years has led to more revealing tests of the forward-looking theory and has raised puzzling new questions. Three strands of the new research are particularly important: the use of rational expectations to measure future income prospects, the analysis of data on the histories of thousands of individual families, and case studies of particular economic policy "experiments."

RATIONAL EXPECTATIONS The hypothesis of consumers as forward-looking decision-makers already postulates a considerable degree of rationality to consumers. The hypothesis of rational expectations postulates more, but not necessarily less plausible, rationality. Recall that Ando, Modigliani, and Friedman postulated rather naive assumptions about what people expected about their future income: that it would tend to stay where it was recently. The rational expectations approach attempts to look at the actual historical behavior of income and use this to describe statistically how people

The approach is a statistical formalization and a much finer version of the rough check on the theory that we described at the start of this section. Rather than just saying that people expect business cycles to be temporary, the approach assumes that people act as if they have a little model of the behavior of income over the business cycle in their heads and that they use this model when guessing their future income. Of course, nobody would actually use such a model in their personal family planning: The idea is that by watching television, reading the newspaper, or just talking with friends, people get a view of future economic developments that is not much different from that of the average professional economist who actually uses such a model.

The rational expectations approach is used by many economists engaged in macroeconomic research.[6] The most straightforward version of this approach is to substitute the forecasts of income from such a model into the permanent-income equation (10.5) for consumption. More technical versions substitute forecasts of future income into the intertemporal budget constraint, Equation 10.3, and calculate the optimal plan for consumption directly without the intermediate step of Friedman's permanent-income equation. Using rational expectations this way clearly requires advanced mathematical skills, and understandably the approach has attracted economists who specialize in such skills.

It is clear now from this research that the forward-looking consumption theory does not fare as well as when people are assumed to forecast rationally. One problem is that consumption is a bit too responsive to temporary changes in income, although clearly not as responsive as in the simple Keynesian consumption theory. In other words, the forward-looking theory with rational expectations suggests that the short-run marginal propensity to consume should be even smaller than is observed in the United States data summarized in Table 10.1.

INDIVIDUAL FAMILY HISTORIES One of the most important improvements in our knowledge of the economy in recent years is the availability of data on the economic histories of individuals and families over a span of several years. At the University of Michigan, for example, a survey called the

[6]The research referred to is found in a series of papers published in the *Journal of Political Economy*: Robert Hall, "Stochastic Implications of the Life Cycle–Permanent Income Hypothesis: Theory and Evidence," *Journal of Political Economy*, Vol. 86 (December 1978), pp. 971–988; and Marjorie Flavin, "The Adjustment of Consumption to Changing Expectations about Future Income," *Journal of Political Economy*, Vol. 89 (October 1981), pp. 974–1009. Lars Peter Hansen and Kenneth Singleton have incorporated rational expectations into the budget constraint in a formal intertemporal planning process in their "Stochastic Consumption, Risk Aversion, and the Temporal Behavior of Asset Returns," *Journal of Political Economy*, Vol. 91 (April 1983), pp. 249–265. All these papers are technically demanding. They are listed here as sources; we suggest

Panel of Study on Income Dynamics has kept tabs on the major economic and personal events of thousands of families since 1969. Such surveys that collect information on individuals over a number of years are typically called **panel** or **longitudinal surveys.** They are useful to macroeconomists because they tell how families experience recessions and booms individually. Aggregate data tell us only about all families in the economy added together. One study has looked at how well the forward-looking consumption model performs in describing the consumption behavior of about 2,000 families in the Michigan panel data set.[7] The results show an excess sensitivity of consumption to temporary changes in disposable income. The marginal propensity to consume from temporary income was about 30 percent of the marginal propensity to consume from permanent income. This is higher than the 5 to 10 percent ratio that the pure forward-looking model suggests. The results seem to say that about 80 percent of the families behaved according to the forward-looking model, while about 20 percent behaved according to a simple model in which consumption is proportional to disposable income.

POLICY EXPERIMENTS In 1968 during President Johnson's administration, Congress passed a temporary surcharge on the personal income tax; the surcharge raised taxes by 10 percent. One purpose was to restrict consumption temporarily and thereby reduce aggregate demand in an economy overheated by Vietnam War expenditures. A similar temporary tax change occurred during President Ford's administration, but in the reverse direction. When the economy was in the trough of the 1974–75 recession, a tax rebate and social security bonus of $9.4 billion was paid out. The hope was to stimulate the economy by increasing aggregate demand. According to the forward-looking theory of consumption, families who realized that these tax changes were temporary would adjust their consumer expenditures by only a small amount; if so, the policy changes would not have their desired effect of restricting demand in 1968 or stimulating demand in 1975. On the other hand, according to the simple consumption function, these tax changes would be translated into large changes in consumption and thereby in aggregate demand.

Although clearly not conceived as experiments, these two changes in policy gave economists a rare opportunity to test the predictions of the forward-looking theory of consumption. It is probably as close as macroeconomics will ever get to a laboratory experiment. As it turned out, the response of consumption to the change in disposable income seemed to be small in both cases. After the increase in taxes in 1968 consumers simply saved less of their reduced income and thereby reduced their spending only slightly.

[7]Robert Hall and Frederic Mishkin, "The Sensitivity of Consumption to Transitory Income: Esti-

In the second quarter of 1975 the rate of saving as a fraction of disposable income rose to almost 10 percent, from about 6 percent in the first quarter. Almost all the increase in disposable income was saved, evidently because people knew the temporary nature of the income changes. In addition to providing evidence in favor of the forward-looking theory of consumption, the lesson from these two policy experiments has been to make policymakers much more reluctant to use such temporary tax changes to affect aggregate demand. Economists in the Ford administration wrote in the 1977 *Economic Report of the President:* "Consumers normally adjust expenditures to their 'permanent' or long-run income." In 1977 President Carter came into office proposing another rebate to stimulate the economy out of an apparent slowdown in the recovery, but the proposal was criticized by many economists and was not passed by Congress.

In 1992 President Bush proposed to reduce the amount of taxes that were withheld from workers' paychecks in order to speed the recovery from the 1990–91 recession. However, the reduction in withholding in 1992 implied a smaller refund for taxpayers in 1993. This proposal was much like the temporary tax cuts of the 1970s. As predicted by the forward-looking consumption model, the effect on consumption was small.

Statistical research on temporary tax experiments indicates that the marginal propensity to consume from a temporary tax change is about half the marginal propensity to consume from a permanent tax change. This ratio is a bit above that found in the Michigan panel data (.3). In other words, the world is split about 50–50 between forward-looking consumers and those who consume a constant proportion of their current disposable income. Perhaps the most important lesson from these experiments is that the response of the economy to a temporary income tax change is not the sure, predictable stimulus predicted by the simple consumption function.[8]

Defects in the Forward-Looking Model

Overall the empirical research discussed above indicates that the forward-looking model works fairly well: the marginal propensity to consume from temporary income is always less than the marginal propensity to consume from permanent income, as the theory predicts. But why doesn't it work better? Why does consumption respond as much as it does to temporary income? One reason is that the tests might be incorrectly estimating expectations of future income. In the case of temporary tax changes, for example, families may not be so aware of the machinations of the government. Perhaps

[8]Alan Blinder, "Temporary Income Taxes and Consumer Spending," *Journal of Political Econ-*

hey pay no attention to the news about tax changes. If they see the benefits of a tax cut in the form of reduced withholding deductions from their paychecks, they may mistakenly assume that this cut in deductions is permanent. Then they will apply their regular marginal propensity to consume from

NEW RESEARCH IN PRACTICE
Locked-Up Savings

ycle theory of consumption says that famld gradually accumulate assets in order to etirement. It doesn't say how families ld their savings—they could be in savings mutual funds, or in individual stocks and ne theory says that families should treat ngs as a pool—it does not predict that vould have separate funds earmarked for nt.

:, most families hold virtually all their sav:cked-up form. Even among families close nent, only a minority have assets in acnere they are free to withdraw. Most ave the great bulk of their assets tied up quity, retirement plans, and life insury follow the life-cycle principle, but keep ngs locked away. It appears that they do themselves not to dip into savings if the e not locked away.

Laibson of Harvard University has develeory of locked-up saving. He hypothe-*rbolic discounting of future satisfac*sumption this month delivers much more n than you foresee from consumption in nths and years. As a result, you will plan ne as much as you can this month, by lown all available assets.

bolic preferences are evenhanded in their of the near future and the distant fu- think about spreading consumption in ay the life-cycle model describes. In paru would like to plan to save for retire- you can see that your propensity to rything you can on current consumption will defeat a saving plan. In the first place, the plan you make today won't include any saving today. You will plan to start saving next month. When next month rolls around, though, you will defer the onset of savings. You will never start your saving program.

Now suppose someone offers you a contract. After signing it today, you are obligated to pay into an account each month starting next month. You can't withdraw from the account until you are 65. You will sign the contract enthusiastically. It solves the problem of providing for retirement by locking your savings up.

The three main forms of locked-up saving are retirement programs, mortgages, and life insurance. These account for a large fraction of the saving of all but the richest families.

Financing retirement is not the only objective of locked-up savings. Some people join Christmas clubs, where their savings are locked up until the next Christmas.

Some forms of locked-up saving—life insurance and Christmas clubs—offer poor returns compared to ordinary investments, yet remain popular.

Laibson's theory of locked-up saving seems to explain some of the features of the way families save. And it may explain the political popularity of the single biggest locked-up fund, the social security system.

Although hyperbolic preferences are different from the preferences that underlie the life-cycle model, as long as families can make full use of locked-up accounts, their actual behavior will be almost the same as predicted by the life-cycle model.

income. Moreover, when they find their deductions back up to the old level, they will reduce consumption accordingly.

Or suppose the family pays close attention to the economic news and believes that a temporary tax cut will accomplish its purpose of stimulating the economy. The family will benefit in the next year or two from the more favorable performance of the economy. According to the life-cycle and permanent-income hypotheses, the family should immediately increase its consumption because of its expected increase in economic well-being. Even though such a family would spend only a little of its tax rebate, it might raise its total consumption level because of the improved national economy.

Another possibility is that consumers cannot borrow as easily as the forward-looking model suggests and that especially during recessions they cannot obtain the funds to maintain their consumption. Economists call such consumers **liquidity constrained.**[9] Such consumers might be described very well by the simple Keynesian model; they would increase their expenditures as they receive more income regardless of whether it is permanent or temporary.

In concluding our discussion of the forward-looking model of consumption, it is important not to lose sight of the central ideas by focusing too much on the particular equations or tests that express them. The basic point is that families are thoughtful about consumption decisions. The way they react to a change in economic circumstances depends on the context of the change. If the change is transitory—if it involves a windfall gain or loss—consumption is likely to respond relatively little. If the change in income will sustain itself for the foreseeable future, consumption will change almost by the full amount of the change in income.

EMPIRICAL EVIDENCE ON THE FORWARD-LOOKING MODEL OF CONSUMPTION

1. Verification of the forward-looking model with aggregate data confirms its main implications.
2. More detailed tests with data on individual families reveal some shortcomings. Liquidity constraints may help explain the discrepancies between theoretical predictions and actual behavior.

[9]See Fumio Hayashi, "Tests for Liquidity Constraints: A Critical Survey and Some New Obser-

10.5

REAL INTEREST RATES, CONSUMPTION, AND SAVING

Thus far we have assumed that consumers want a steady consumption path. They would like to consume about the same amount this year as next year and every year thereafter. This is a reasonable assumption if the price of future consumption goods is not too low or too high relative to present consumption goods. But suppose that the price of future consumption goods is suddenly expected to fall; suppose, for example, that sales taxes will be repealed starting next year! Clearly people would postpone their consumption expenditures until next year to take advantage of the lower price. They would do this as long as they were not so impatient that they couldn't get along without the goods this year. Consumption today would fall and consumption next year would rise.

The interest rate becomes a factor in consumption because it affects the price of future consumption relative to current consumption. In fact, the *real* interest rate is the relative price between present consumption and future consumption. It thus directly affects the choice of whether to consume more today or tomorrow. Recall that the interest rate quoted in the newspaper, the *nominal* interest rate, does not correct for changes in purchasing power. The real interest rate R equals the nominal interest rate minus the expected rate of inflation π^e. For example, if the nominal interest rate is 7 percent, but prices are expected to rise at 3 percent per year, then the real interest rate is 4 percent. If you postpone 1 unit of consumption this year, you can consume 1.04 units next year by investing at a 7 percent nominal rate and losing 3 percent to inflation.

If the real interest rate is positive, as it generally is, people face an incentive to defer spending: a dollar saved today will buy more than a dollar's worth of goods tomorrow. Hence people will tend to defer consumption unless they are too impatient. Economists have a measure of impatience called the **rate of time preference.** If the real interest rate is higher than the rate of time preference, then people will tend to shift their consumption a bit toward the next year. If the real rate of interest is high, today's consumption will tend to be low. This factor makes consumption negatively related to the real rate of interest. Saving, which is simply the difference between disposable income and consumption, is therefore positively related to the real rate of interest.

Changes in the interest rate do something else in addition to changing tomorrow's price of goods relative to today's. They change income. If interest rates rise, for example, a family can earn a higher real return from its accu-

consumption is higher. This increase in consumption might offset the reduced consumption that comes from the incentive to defer consumption from today to tomorrow. Hence, we can't say unambiguously whether consumption in the first year falls or rises; the *income* effect makes it rise, while the incentive to make a *substitution* of future consumption for present consumption makes it fall. Similarly, the effect of change in the real interest rate on saving is also ambiguous.[10] Of course, this offsetting tendency of the income effect and the substitution effect is common to many relative price changes in economics, not only to interest-rate changes.

It is a controversial matter whether or not consumption is negatively related to the interest rate in the U.S. economy.[11] The most difficult problem in interpreting the data is that consumption depends on disposable income as well as on the interest rate, and during the business cycle income and the interest rate tend to move together. It is difficult to separate out the effect of just the interest rate.

Another complication in examining the relation between real interest and consumption is that the real interest rate is not observed directly. What we observe is the nominal interest rate. To convert it to a real rate, we must subtract the expected rate of inflation. Measuring the expected rate of inflation is difficult.

Effect of Real Interest Rates on Work

There is one last complication in our analysis of consumption. For this whole chapter we have assumed that individuals do not or cannot change how much they work. Income from work was taken as exogenous. But some people are free to vary how much they work. In particular, if real interest rates rise, the value of income from working today relative to tomorrow rises. People could gain from working harder and longer hours now and taking time off to spend the earnings later. Hence, in principle, income from work is a positive function of the real interest rate. Because saving is the difference between disposable income and consumption, this positive effect of real interest rates on income from working reinforces the negative effect of real interest rates on consumption to make saving positively related to income.

Detecting the effect of real interest rates on work effort has proved even more elusive than detecting the effect of real interest rates on consumption. It appears that most people cannot or do not adjust their work effort very much in response to interest-rate changes. This corresponds with casual observation.

[10]The income and substitution effects are shown graphically in the appendix to this chapter.

[11]One attempt to measure the substitution effect alone is Robert E. Hall, "Intertemporal Substi-

CONSUMPTION, SAVING, AND THE INTEREST RATE

1. The consumption planning process should take the interest rate into account. The real interest rate—the nominal interest rate less the expected rate of inflation—is the trade-off facing the consumer between current and future consumption. When real interest rates are high, future consumption becomes cheaper relative to consumption this year.
2. It is difficult to isolate the effect of interest rates on consumption in actual data. There is no strong empirical confirmation of the theoretical possibility that saving responds positively to real interest rates, at least for the variation in real interest rates observed in the United States.
3. In principle, interest-rate changes may cause people to reallocate labor supply over time. Higher interest rates today increase the return to current labor effort measured in units of future consumption. Evidence suggests this effect is very weak.

CONSUMPTION AND THE IS CURVE

In Chapter 7 we introduced the IS curve. It shows all the combinations of real GDP and interest rates where spending balance occurs. To find a point on the IS curve, we consider a particular interest rate. Then we find the level of GDP that gives spending balance at that rate. The IS curve is downward-sloping in the IS-LM diagram with the interest rate R on the vertical axis and output Y on the horizontal axis. The slope of the IS curve and how much it is shifted by fiscal policy are crucial for evaluating the effects of monetary and fiscal policy.

Recall that the simple Keynesian consumption function was used in the derivation of the IS curve in Chapter 7. How is the IS curve affected by the factors considered in this chapter?

The Slope of the IS Curve

Consider first the slope of the IS curve. The smaller the marginal propensity to consume, the steeper the slope of the IS curve. A small MPC means that

MPC. In our complete model, departures of output from potential are best thought of as temporary changes in income. Thus, the variation in income along the IS curve is a variation in temporary income, for which the marginal propensity to consume is likely to be quite small. On this account the IS curve is steeper than it seemed in Chapter 7, because output is less sensitive to the interest rate.

However, the interest-rate effects on consumption considered in the preceding section have an opposite effect on the IS curve. If consumption depends negatively on the interest rate, then a higher interest rate will shift the consumption function down, in which case the level of GDP corresponding to spending balance will be lower. On that account the IS curve is flatter than it seemed in Chapter 7, because output is more sensitive to the interest rate.

On balance it is an empirical question whether the true IS curve that incorporates the issues raised in this chapter is flatter or steeper than the IS curve derived in Chapter 7.

Shifts in the IS Curve Due to Tax Changes

The IS curve in Chapter 7 did not distinguish between temporary and permanent changes in taxes. A cut in tax payments of any kind would shift the IS curve to the right by the same amount and thereby stimulate output by the same amount. The forward-looking theory of consumption says that the shift in the IS curve should be much larger if the tax cut is permanent rather than temporary. A purely temporary tax cut—such as the 1975 tax rebate—would have a very small effect on the IS curve.

Because it is sometimes difficult to tell whether people think a tax cut is permanent or temporary, the forward-looking theory points to an element of uncertainty in our ability to determine how much the IS curve will shift in response to tax changes.

Finally, the forward-looking theory says that the IS curve will shift to the right in response to an *expectation* of future tax cuts. Future tax cuts will stimulate consumption today because lifetime disposable income has increased.

REVIEW AND PRACTICE

Major Points

2. There have been, however, significant deviations from a simple consumption function.
3. The forward-looking consumption theory relates consumption to current and expected future income rather than to just current income.
4. In this view, the marginal propensity to consume from transitory changes in income is much lower than that from permanent changes in income.
5. Tax policy does not operate in a mechanical way through disposable income. Families raise their consumption only if a tax cut makes them feel better off, which may not happen with some types of cuts.
6. The forward-looking model passes empirical tests with aggregate data quite well, but still has some defects, which have been revealed mainly by studies of individual family behavior.
7. Though higher real interest rates ought to stimulate saving by making consumers defer consumption, this hypothesis has not been firmly established by the data.
8. The marginal propensity to consume is one of the determinants of the slope of the IS curve. Because of automatic stabilizers and the low short-run marginal propensity to consume of forward-looking consumers, the IS curve may be steeper than the one derived in Chapter 7.

Key Terms and Concepts

consumption
disposable income
Keynesian consumption function
marginal propensity to consume (MPC)
intertemporal budget constraint
smooth consumption path
Friedman permanent-income model
Ando-Modigliani life-cycle model
rational expectations tests
panel data tests
real interest rate
rate of time preference
long-run marginal propensity to consume
short-run marginal propensity to consume
forward-looking theory of consumption
marginal propensity to consume out of temporary income
marginal propensity to consume out of permanent income
substitution effect
automatic stabilizers

Questions for Discussion and Review

1. List some of the reasons that disposable income is less than GDP. What factors tend to raise disposable income even though they are not part of GDP?
2. How can you tell if a simple consumption function governs the relation of consumption and income?
3. What is an estimate of the marginal propensity to consume from the historical relation of consumption to income? Why is this estimate probably an overstatement of the reaction of consumption to a temporary tax cut? What is an estimate of the short-run marginal propensity to consume?
4. Outline the way that a family might plan its consumption. How would it react to learning that tax rates are going to rise in the future?
5. Why is the marginal propensity to consume out of temporary income a bit above

3. Given your findings in Question 2, what are the sizes of the corresponding multipliers for a change in the money supply? Is monetary policy now more or less effective in changing the level of economic activity?
4. In the basic AD/PA model, does an increased responsiveness of consumption to current income lead to faster or slower adjustment to equilibrium GDP following a cut in the money supply? Explain your answer in words.
5. Plot the saving rate ("Saving/GDP%") using quarterly data from 1980.1 to 1983.4. What major event during this time period may account for the pattern in the saving rate?

APPENDIX: A Graphical Approach to Consumption Planning

In this appendix we show how a two-period consumption planning problem can be represented graphically. Suppose that the representative family must choose how much to consume this year and next year. Figure 10.9 shows how the family's pref-

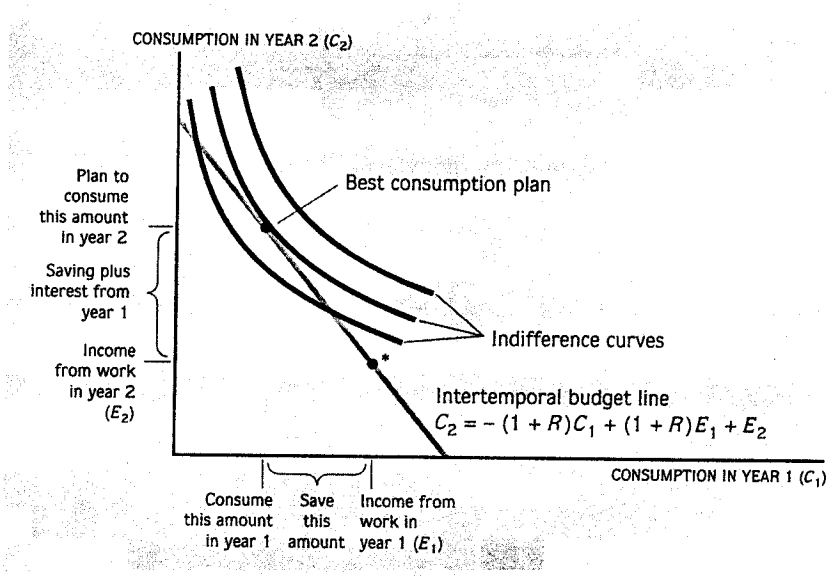

FIGURE 10.9 Indifference Curves and the Intertemporal Budget Line for Consumption Planning

The indifference curve is the combination of consumption in the two years that gives the same level of satisfaction to the family. The straight line is the budget constraint. The family tries to get to the highest indifference curve. This occurs where the indifference curve and the budget line just meet at a point of tangency.

choices for consumption in the two periods might look, the vertical axis is consumption next year (Year 2) and the horizontal axis is consumption this year (Year 1). The curved lines are **indifference curves;** they give the alternative values for consumption in the two years between which the family is indifferent. The slope of the line measures how many dollars of consumption next year must be given up when consumption this year rises by 1 dollar for the family to maintain the same level of satisfaction, or utility. This is sometimes called the **marginal rate of substitution** between consumption this year and consumption next year. The family is better off when the indifference curves are farther out and up.

The straight line in Figure 10.9 is simply the intertemporal budget constraint for the two periods. The slope of the line is $-(1 + R)$ because the family will have an additional $(1 + R)$ dollars of consumption next year for each dollar of consumption that is reduced (and thus saved) this year. [The equation for the budget line comes directly from Equation 10.3 with no taxes, no initial assets, and no bequest, and is applied for two periods. Then Equation 10.3 is $A_2 = E_1 - C_1$ in year 1, and $0 = (1 + R)A_2 + E_2 - C_2$ in year 2. Putting A_2 into the equation for year 1 gives the equation for the budget line.] The point on the line marked * represents the amount of income

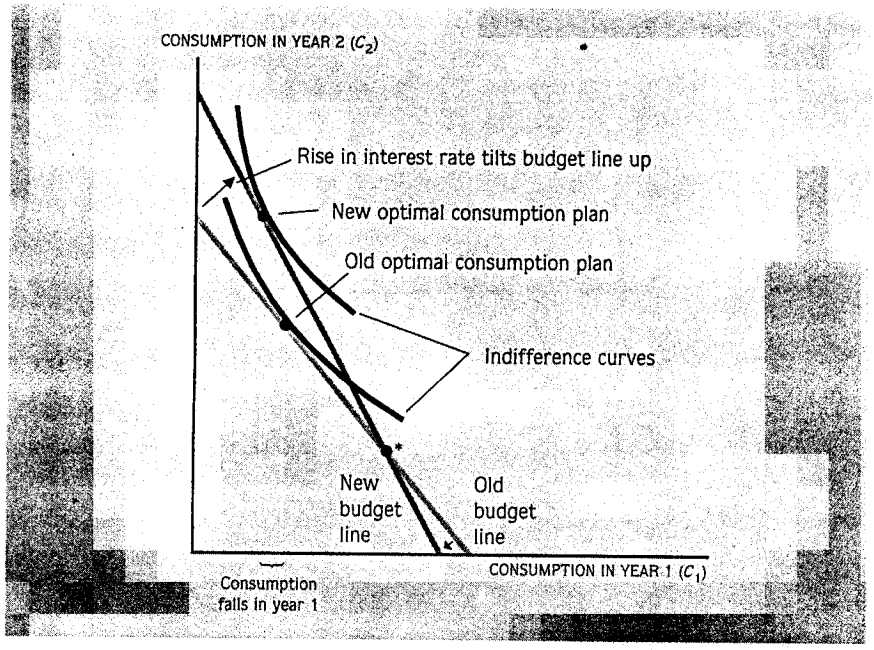

FIGURE 10.10 Increase in the Interest Rate

As the interest rate increases, the budget line gets steeper. This leads to a higher level of utility. As drawn, the family consumes less this period. But it is uncertain whether the family will consume less if other indifference curves are drawn.

from work this year and next year. Moving up the line from * means that the family is saving this year, because income is greater than consumption. Moving down on the line means that the family borrows this year.

The family tries to maximize utility or, in terms of the graph, to get to the highest indifference curve. This occurs at a point of tangency between the budget line and the indifference curve, as shown in the diagram. At this point the slopes are equal so we know that the marginal rate of substitution between consumption next year and consumption this year is equal to 1 plus the interest rate.

Now, suppose that the interest rate increases. This is shown in Figure 10.10. The budget line will then tilt in a steeper direction, pivoting around the point *. A higher level of utility is thereby achieved. As the graph is drawn, less is consumed this year. But note that this depends very much on how the indifference curves are drawn. (Try to draw another for which the reverse occurs). The tilting of the curve represents the substitution effect, which certainly causes consumption this year to fall. But the budget line has also moved out to the right from where it was before on the indifference curve. This is the income effect. It certainly leads to more consumption today.